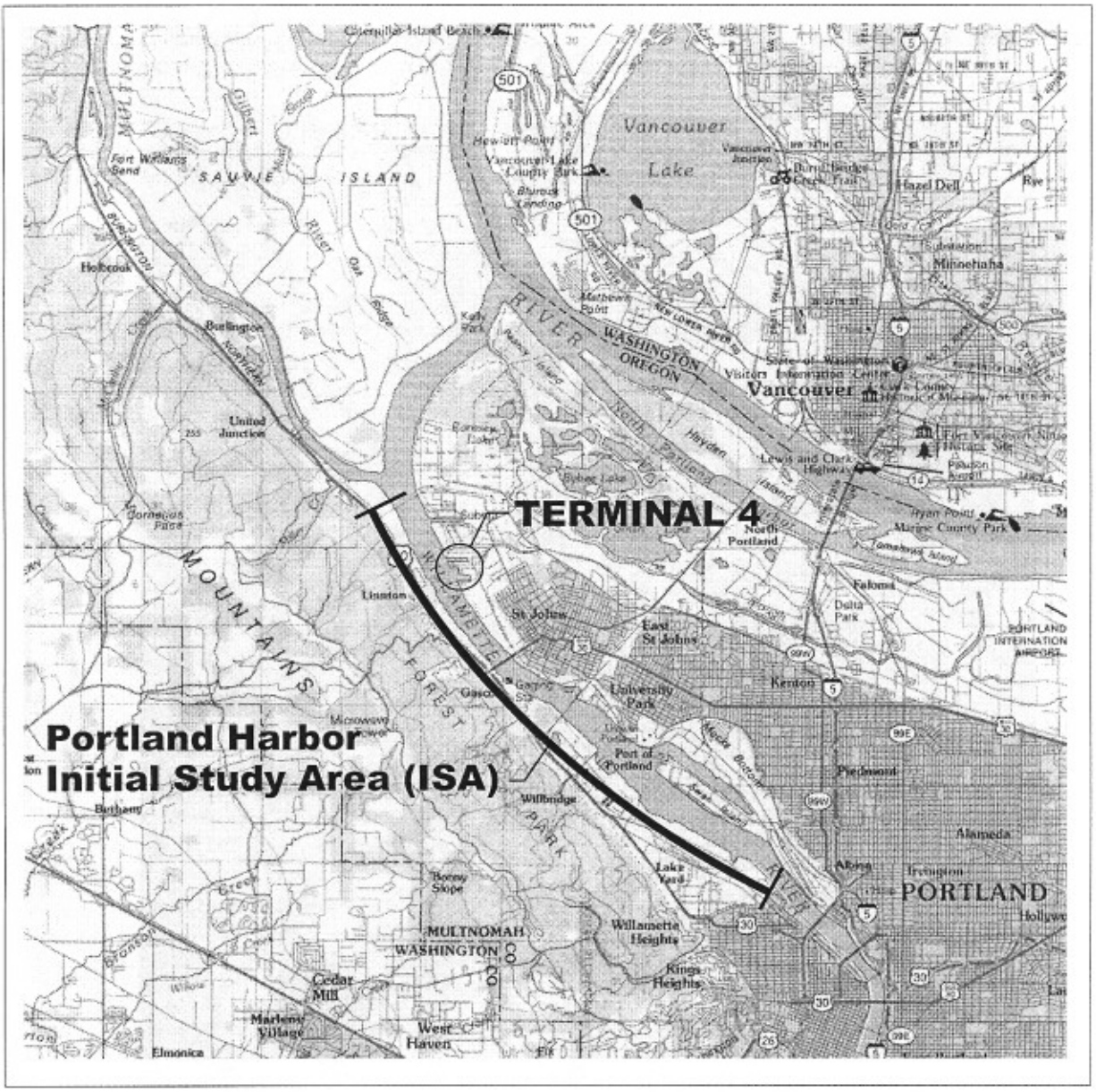
EPA ACTION MEMORANDUM
TERMINAL 4
FIGURES



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PORT OF PORTLAND
PORTLAND, OREGON

TERMINAL 4 EARLY ACTION
EE/CA REPORT

VICINITY MAP

BBL
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

FIGURE
1-1

EPA ACTION MEMO FIGURE 1

N

0 600 1200

Approximate Scale in Feet

Note: Date of Photo: July 9, 2002

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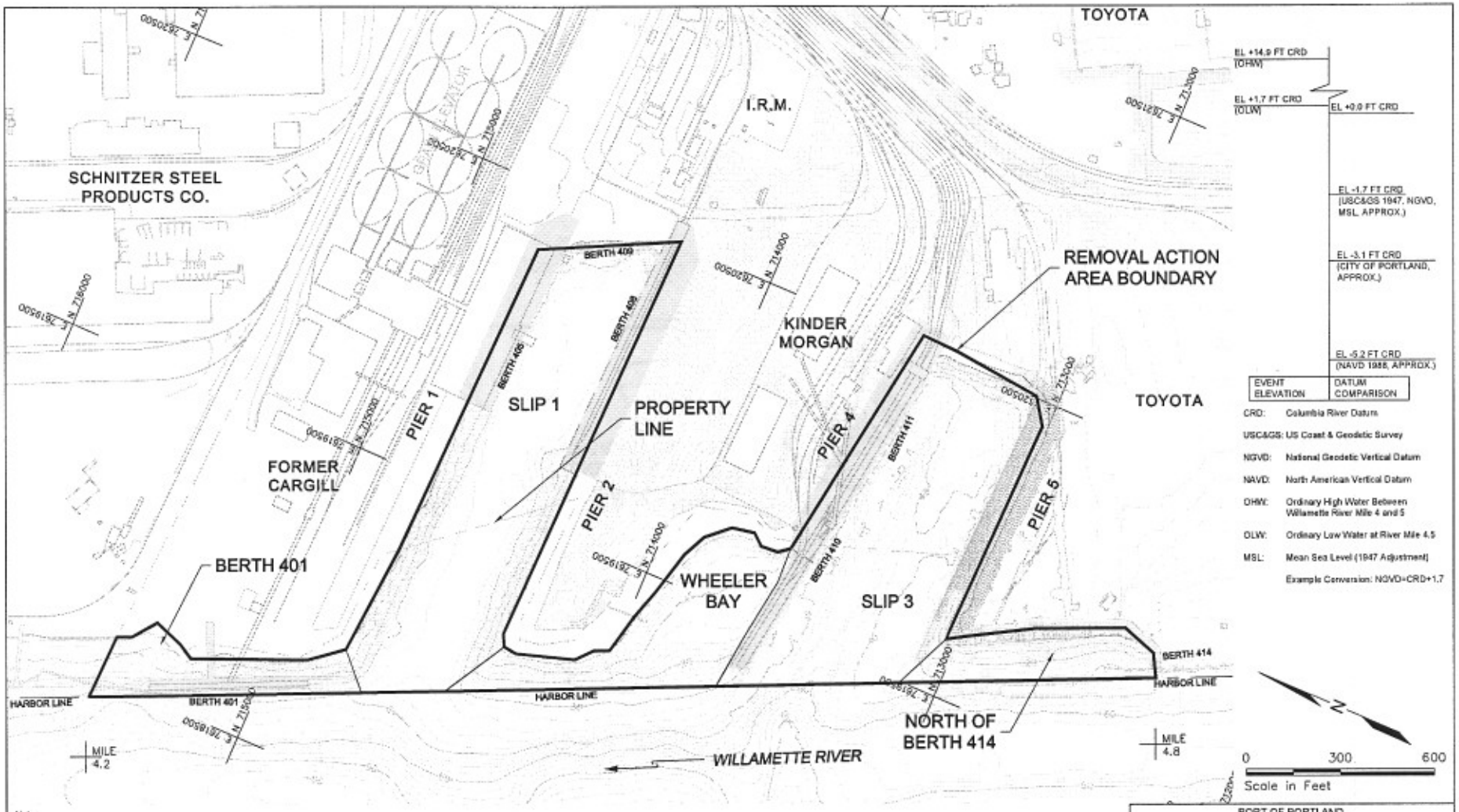
TERMINAL 4 AERIAL PHOTOGRAPH

BBL

FIGURE
1-2

EPA ACTION MEMO FIGURE 2



Notes:

1. Upland topographic vertical datum is NGVD; Bathymetric vertical datum is CRD.
2. Site Plan is based on drawings provided by the Port of Portland.
3. Shoreline boundary for Ordinary High Water is approximate.
4. Willamette River Mile reference marks are approximate.
5. Diurnal tide range during low river stages is 2.2 feet at St. Johns and 2.4 feet at Portland.
6. Datum conversion tables to CRD provided by Port of Portland.
7. Ordinary Low Water elevation provided by USACE.
8. Ordinary High Water elevation provided by Port of Portland.
9. Datum conversion tables to CRD provided by Port of Portland.

Existing Piers

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SUBAREAS WITHIN THE TERMINAL 4 REMOVAL ACTION AREA

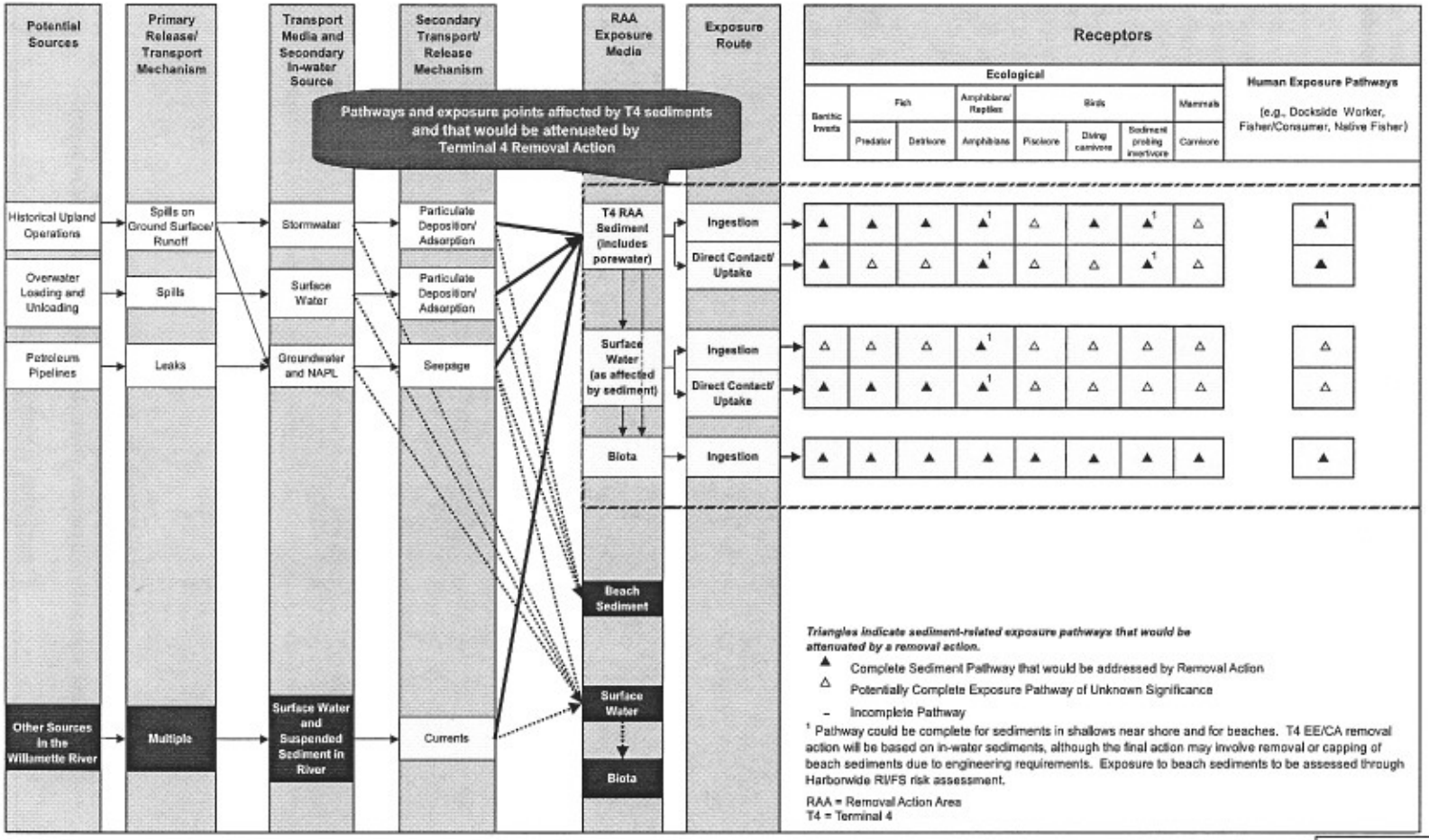
BBL BARANI, BOWICK & LEE, INC. engineers & scientists

FIGURE 7-1

DWG NAME: G:\project\Clients\BBL\Terminal 4\t4_048 (EECA 7-1).dwg
DATE: 01/11/05 10:48am

EPA ACTION MEMO FIGURE 3

NOTE: This diagram is intended to show (1) the potential pathways by which generalized receptors may be exposed to contaminants through sediment-associated pathways, and (2) those pathways that would be attenuated, in whole or in part, by sediment removal actions at T4. Due to the streamlined nature of the EE/CA process, not all pathways will be the subject of extensive risk analysis in the EE/CA.



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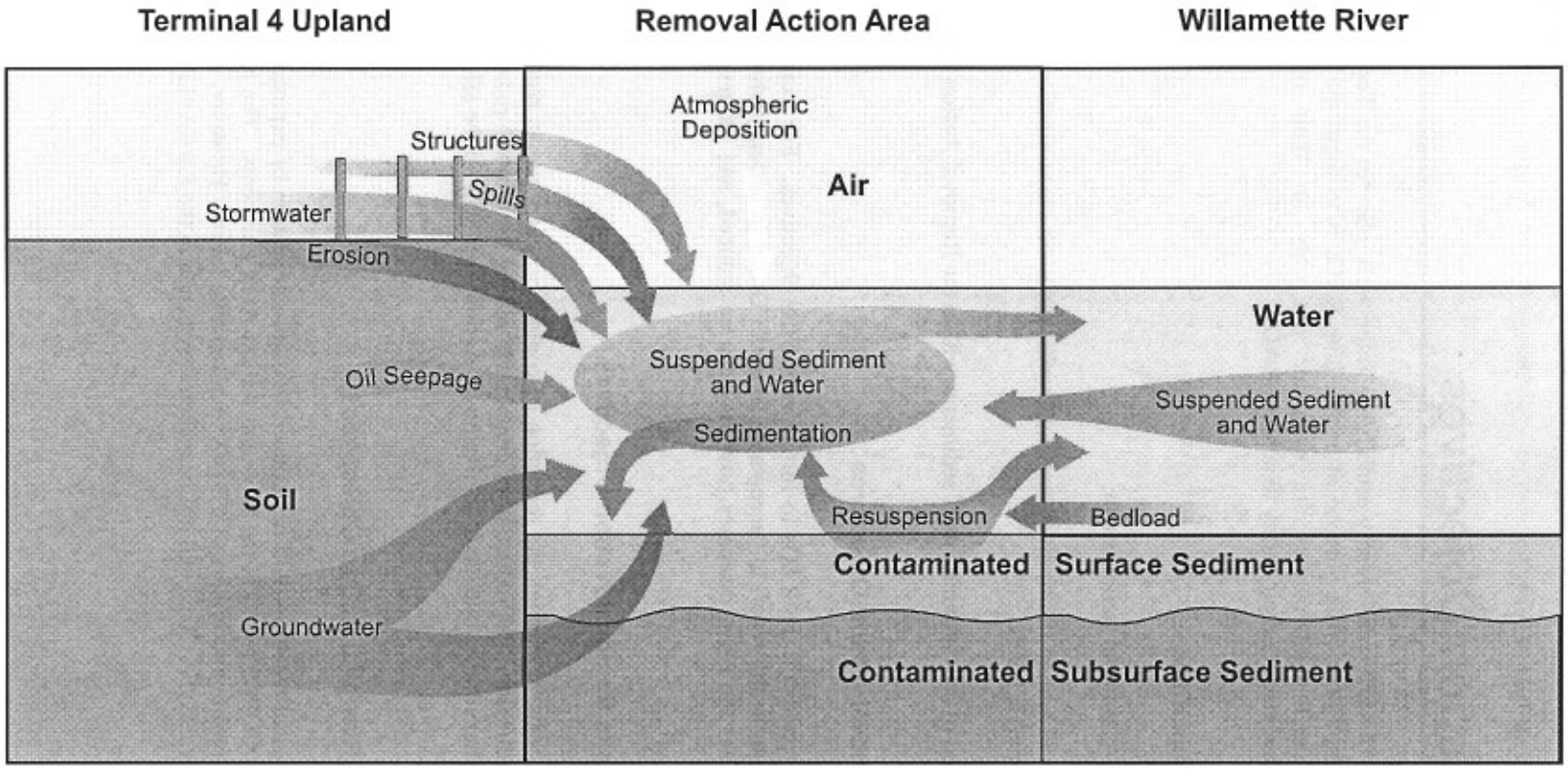
CONCEPTUAL MODEL FOR TRANSPORT AND EXPOSURE PATHWAYS RELEVANT TO THE TERMINAL 4 EE/CA

BBL

FIGURE
3-1

EPA ACTION MEMO FIGURE 4



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GEOCHEMICAL CONCEPTUAL MODEL

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FIGURE
3-2

EPA ACTION MEMO FIGURE 5

7.3.4 Alternative C: Dredge Emphasis with CDF Disposal – At-Grade Full-Size CDF

Alternative C consists of construction of an at-grade CDF that occupies the entire Slip 1; a combination of dredging, capping, and MNR in Slip 3; a combination of MNR and capping in Wheeler Bay and Berth 401; and MNR in the North of Berth 414 subarea. Operationally, Pier 4 in Slip 3 and Berth 401 remain active. The grain facility barge leg and the International Raw Materials barge operations in Slip 1 are relocated, as demolition of warehouses and piers is assumed, including pulling/breaking timber piles and providing upland disposal of timber piling and construction debris. Outfalls are completely relocated and rerouted. Former storm sewer piping discharge to Slip 1 is abandoned under this alternative. Institutional controls for capped areas would include anchoring restrictions for commercial vessels and updating Port engineering maps/plans identifying the capped areas for any planned construction projects or changes in operations to ensure the integrity of the cap is not disturbed or compromised. Institutional controls for the CDF would include updating engineering baseline maps/plans to include the CDF boundaries, update provisions in tenant leases, as applicable, formalizing notification procedures for construction or change in operations in the area of the CDF. Deed notifications or easements may also be considered.

Detailed Description:

Slip 1 – Full At-Grade Confined Disposal Facility (CDF)
Sediment dredged in Slip 3 is disposed of in the Slip 1 CDF. An at-grade CDF that occupies the entire Slip 1 has excess capacity available for other dredged sediment. By constructing the CDF to an at-grade surface, the newly gained land can be used for water-dependent purposes consistent with existing zoning and Port use. An earthen containment berm is constructed at the mouth of Slip 1 to serve as an isolation/retaining structure for the dredged sediment. The area under the containment berm is dredged. The berm is placed on State-owned property. Use of State property requires negotiation.

Slip 3 – Combination of Dredging, Capping, and Monitored Natural Recovery
The Removal Action in Slip 3 consists of a combination of dredging, capping, and a relatively small area of MNR (i.e., the under-pier area at Berth 410 below the finger pier portion). The area at Pier 5 is capped, while the area between Pier 4 and Pier 5 is dredged. Dredging is performed in front of Pier 4 to remove contamination. Capping is impractical due to the need to maintain ship access to the actively used Berths 410 and 411. The nearshore slopes under Pier 4 at Berth 411 are capped. Dredging under this pier is impractical due to the presence of riprap. Some dredging, but primarily capping, is used at a relatively small slope area at the head of Slip 3 below the existing pinch pile bulkhead. Dredging in this area would decrease the stability of the slope.

Wheeler Bay – Monitored Natural Recovery and Capping
The depth of detected sediment contamination in Wheeler Bay varied, extending from the surface to beyond 22 feet below the sediment surface. Since contaminant concentrations identified in most of Wheeler Bay are low, MNR is used for the majority of Wheeler Bay. A portion of the slope is capped as shown on the figure because of higher PAH concentrations in one sample location.

North of Berth 414 – Monitored Natural Recovery
Similar to Wheeler Bay, low contaminant concentrations were found in the North of Berth 414 subarea up to 22 feet below the sediment surface. Therefore, MNR is used north of Berth 414.

Berth 401 – Monitored Natural Recovery and Capping
MNR is used for the majority of the area at Berth 401 because of low contaminant concentrations. A relatively small area in the northeast corner of the Berth 401 area would be capped because of marginal PCB concentrations in one sample location.

Construction Sequence, Comments, and Assumptions:

- It is assumed that approximately 10,000 cy of sediments would be dredged in Slip 1, in the area of the footprint of the CDF containment berm, to remove contaminated sediments and to provide a firm foundation for the berm.
- The sediments dredged in Slip 1 would be placed near the head of the slip. Placement should be performed with care to minimize sediment resuspension.
- The CDF containment berm would be constructed prior to dredging in Slip 3. The berm may be constructed in stages to allow barge access for disposal of Slip 3 sediments. If sediments are transported to the CDF in pipelines, it is assumed that the entire berm would be constructed prior to dredging. The berm material volume is fairly large and berm construction may take longer than one construction season.
- Dredging in Slip 3 should be performed prior to capping in that area to avoid recontamination of slope areas.
- Kinder Morgan's operations would be disrupted during the duration of dredging in Slip 3.
- An intermediate CDF cap may be required at the conclusion of Slip 3 dredging unless the period between disposal events is relatively short.
- Capping under the pier at Berth 411 may be performed during the year after dredging to minimize disruption of Kinder Morgan's operations.
- Simultaneous berm construction and capping in Wheeler Bay and at Berth 401 should be possible.

Assumed Schedule:
For barge transport:

- Year 1: Stage 1 berm construction and simultaneous capping in Wheeler Bay and at Berth 401. Miscellaneous other work such as demolition of piers and warehouses.
- Year 2: Dredging in Slip 3. Possibly placement of intermediate CDF cap.
- Year 3: Stage 2 berm construction and capping in Slip 3.

For pipeline transport:

- Year 1: Stage 1 berm construction and simultaneous capping in Wheeler Bay and at Berth 401. Miscellaneous other work such as demolition of piers.
- Year 2: Stage 2 berm construction, dredging in Slip 3 following completion of berm, and possibly placement of intermediate CDF cap.
- Year 3: Capping in Slip 3.

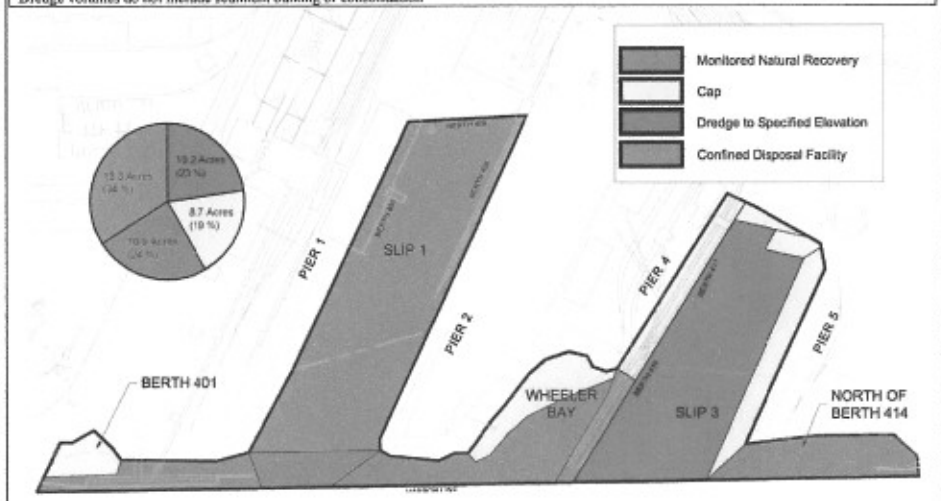
Filling of the CDF will continue after construction year 3.

Cost
Net Present Value (2005) = $30,555,000 ($20,555,000 including value of excess capacity)

IMPORTANT QUANTITIES

Item	Units	Quantity					
		Slip 1	Slip 3	Wheeler Bay	North of Berth 414	Berth 401	Total
Dredging Area	Acres	1.0	9.2				10.2
Dredging Volume	CY	10,000	105,000				115,000
Interim Cap (if needed)	CY						20,000
Under-Pier Capping Area	Acres		1.7				1.7
Non-Under-Pier Capping Area	Acres		2.8	3.0		1.2	7.0
Total Capping Area	Acres		4.5	3.0		1.2	8.7
Capping Volume	CY		22,000	14,500		5,500	42,000
MNR Area	Acres	0.9	0.7	4.0	3.0	2.3	10.9
Total Capacity of the CDF	CY						940,000
CDF Excess Capacity – Saturated (dredged sediments)	CY						560,000
Unsaturated Zone Capacity (Fill)	CY						245,000
Volume of CDF Engineering Cap	CY						255,000
CDF Berm Volume	CY						138,500

Notes:
cubic yard (CY)
For this calculation, a 10-foot-thick CDF cap was assumed. The top of CDF cap/berm was assumed to be at approx. elevation 31.5 ft. Columbia River Datum (CRD)
Dredge volumes do not include sediment bulking or consolidation



EPA ACTION MEMO FIGURE 6